THE

AMERICAN NATURALIST.

Vol. I.—MAY, 1867.—No. 3.

SOME ERRORS REGARDING THE HABITS OF OUR BIRDS.

BY T. M. BREWER, M. D.

THERE are few who have written upon the habits of our birds that have not inadvertently committed errors. There are none of us, certainly no ornithologists, who, with all the care they may have taken to be right, and with all possible desire to be exact, have not had occasion to retrace their steps, and seek to amend their record. There is no name, however celebrated in the annals of science, but has come down to us associated with more or less of inaccurate observations; and the more extensive his researches, the more brilliant his discoveries, the more numerous shall we find the mistakes and errors he shall have placed on record. These considerations suggest great charity and forbearance in dealing with the errors, the wrong conclusions, or the inaccurate generalizations from too few facts, or from facts which different circumstances, at other times, cause to assume a very different aspect.

At the same time, however charitable we may be, however lenient even towards errors and incorrect statements

that apparently might have been avoided, we should also, all of us, never hesitate to expose and to correct whatever we know to be wrong. We all know but too well, that when a grave error has once been deliberately given as a fact by a distinguished authority, how hard and apparently impossible it is to stop its currency as truth, and to correct the mistaken belief it has caused, and is continually causing.

Take for instance the statement made by one of the earliest explorers of the natural history of our Pacific shores, that the egg of the California Vulture (*Cathartes Californianus*) is *jet black*. However conflicting with all inference by analogy this statement must have ever appeared to every one familiar with Oölogy, it has found its way into nearly every work on American Ornithology published during the present century.

In no department of natural history is extreme accuracy so absolutely indispensable as in that to the study of which the writer has given his chief attention, the nesting and eggs of birds, which, for convenience, is called Oölogy. As the writer, if he lives long enough to publish the completion of his labors in this department, will have to confess himself not an exception to the rule—to which he can find none—and must retrace, amend, and, if he can, efface, it will become him to be especially lenient in his allusions to the mistakes made by the greater lights of American Ornithology.

Among our writers on these subjects, few enjoy or deserve a higher reputation for intelligent observation, great care and general accuracy in his descriptions, than the distinguished pioneer of American Ornithology, Alexander Wilson. The discoverer of many of our rarer birds, he was also a very close observer of their habits, and many of

his descriptions of some of the more common ones are so full and accurate, that they leave us little to add to them. Yet even Wilson, in several noticeable instances, in writing about birds that are far from being uncommon or rare, has given descriptions and accounts which the experience of others, and especially those of the writer, have not been able to verify. We will speak of only a few of these instances.

Let us first take the common American Goldfinch (*Carduelis tristis*), so widely distributed, so familiar to every one, and read what Wilson writes in reference to its nest and eggs: "They build a very neat and delicately formed little nest, which they fasten to the twigs of an apple tree, or to the strong, branching stalks of hemp, covering it on the outside with pieces of lichen, which they find on the trees and fences; these they glue together with their saliva, and afterwards line the inside with the softest downy substances they can procure. The female lays five eggs, of a dull white, thickly marked at the greater end; and they generally raise two broods in a season."

It appears singular to all who are familiar with the nest and eggs of the Goldfinch, which in Massachusetts, so far as the writer has observed, agree in no one thing with the above, how this description could have found a place in the work of so accurate and trustworthy a writer. The explanation is not easy, nor shall we try to suggest one. We will only state, that, without exception, we have ever found the egg unspotted, of a uniform white color, which, when not blown, has a slightly bluish shade. The nest is neat, but "delicate" is far from being an appropriate expression. It is not to be used in reference to the nest of this bird, as we should apply it to the nest of the Hum-

ming Bird, or to that of the Blue-Gray Flycatcher. It is not a "little" nest in view of the relative size of the bird, and we never saw one that was ever covered on the outside with lichen. With us this bird, so far as the writer knows, never builds its nest until as late as the middle of July, and never raises more than a single brood in one season.

To the question: To what bird did the nest described by Wilson as that of the Goldfinch belong? we will in Yankee fashion reply by asking another. Could he by any possibility have had in view the nest and eggs of the *Polioptila cærulea?* This is what Wilson says in regard to the nest and egg of this last-named bird: "It arrives in Pennsylvania, from the South, about the middle of April, and about the middle of May builds its nest, which it generally fixes among the twigs of a tree, sometimes at the height of ten feet from the ground, sometimes fifty feet high, on the extremities of the top of a high tree in the woods. This nest is formed of very slight and perishable materials, the husks of buds, stems of old leaves, withered blossoms of leaves, down from the stalks of ferns, coated on the outside with grey lichen, and lined with a few horse hairs. Yet in this frail receptacle, which one would think scarcely sufficient to admit the body of the owner, and sustain even its weight, does the female cow-bird venture to deposit her eggs."

It does not become a writer who has never happened to have seen the nest of this bird *in situ*, to be over-confident in correcting the above statement. Yet he will venture to say that several kind friends who live, or who have lived, where these birds are common, have supplied him with many nests and eggs of this bird, and the very

last epithet he would think of applying to any he has seen is the word "*frail*." On the contrary, if he were asked to name a bird, the nest of which combined beauty, completeness, safety, and (in view of the small size and light weight of the parent) strength, he could think of no bird he would sooner name than the one he is speaking of. Remember that the bird, as Wilson himself tells us, "but for its length of tail would rank next to the Humming Bird in magnitude." Its nest has invariably been found, so far as we know, very large for the size of its builder, with soft but strongly felted walls, a great depth of cavity, so that there is no danger of the eggs ever rolling or being thrown out by the motion of the branches, or of being broken.

Here let us make a suggestion. Some of our birds, like the Humming Birds, the *Parula Americana*, and others, occupy their nests before they are completed, and finish them afterwards. Sometimes the female begins to deposit its eggs before the nest is half finished, and while incubation goes on, its mate busies himself in completing, strengthening, and beautifying the structure. The Gnat-Catcher may, and is quite likely to be a bird that does the same thing, and Wilson may have seen one not finished, while all we have seen may have been completed. Be that as it may, the whole genus of *Polioptilæ*, so far as we know, *P. cærulea*, *P. melanura* and *P. Lembergii*, all have the same style of nest, and all are conspicuous for their elegance and substantial form.

The Indigo Bird (*Spiza cyanea*), Wilson tells us, is "numerous in all the settled parts of the Middle and Eastern States," and yet he says "The nest of this bird is usually built in a low bush, among rank grass, grain, or clover, suspended by two twigs, one passing up each side;

and is composed outwardly of flax, and lined with fine dry grass. I have also known it to build in the hollow of an apple tree. The eggs, generally five, are blue, with a blotch of purple at the great end."

To this we must add the negative evidence, that we have never found this bird breeding as above described, and, so far as we know, the eggs are invariably white, with only a very light tinge of blue, and they never have purple markings at the greater end, nor have they any spots or markings whatever.

One more remarkable case of incorrectness on the part of Wilson, and we pass to consider other writers. Speaking of the nest and eggs of the Black-throated Bunting (*Euspiza Americana*), he says, "They seem to prefer level fields covered with rye grass, timothy, or clover, where they build their nest, fixing it on the ground, and forming it of fine dry grass. The female lays five white eggs, sprinkled with specks and lines of black."

The position of the nest and materials is, in most cases, as stated; but the eggs are not white, and are unspotted. They are of one unvarying shade of green, strongly tending to blue. Occasionally the nests are built more elaborately than others, and on low bushes or tufts of grass a foot or two above the ground.

Mr. Nuttall, of all our writers who have written so much, has, perhaps, the least to correct where he gives his own personal experiences. Of course he has copied or incorporated into his own narrative very many errors that have originated with others, and for which he is only indirectly responsible. He has also failed to detect some very important errors, when the opportunity was presented, and the means spread open before him. We will take only a single instance. One of the most common birds

of Massachusetts, and especially of that part where Mr. Nuttall resided for many years, is the *Empidonax minimus*, the habits of which, its nesting and eggs, he fully describes, but all of which he attributes to an entirely different species which, so far as I am aware, is never found in Massachusetts: I mean the *Empidonax Acadicus*. To be sure Mr. Nuttall was not alone in this. Even after the Bairds had discovered and described the *E. minimus* as a new species, it was several years before the natural sequence was traced out to its legitimate end. It seems to us now remarkable, as we look back upon the past, and consider how familiar a bird the Least Fly-Catcher was to Mr. Nuttall, that he never once seems to have suspected it of being a new and undescribed species. The error made by Wilson in describing the nest and egg of the *E. Acadicus*, may have contributed to delay and to prevent the discovery of the general error and of the confounding of the species. It was not until by a lucky accident, a parent bird of the true *E. Acadicus*, shot on its nest, was sent, with its eggs and nest, to Prof. Baird, that the whole was made clear, and facts in regard to the two species rightly understood. And here the writer may as well make the confession that all the while he had in his own cabinet the eggs of both species, but supposing the one to be the *Acadicus*, by the rule of exclusion he guessed the other to be, possibly, the egg of the *minimus*, and both were wrong of course. The late Dr. Henry Bryant also, one of our most acute and observing ornithologists,* calls attention to what he supposed to be an error of writers in speaking of the *Acadicus*, as being wild and inhabiting the most solitary places, he having found the supposed birds generally quite familiar, and breed-

*Proceedings of the Boston Society of Natural History, vol. vi. p. 430.

ing near his house. He was unaware that the writers he speaks of, were not wrong in what they had said of the *Acadicus*, and that he and they had different species in view, the habits of which were so different as to be noticed by him, yet not such as to lead him to detect their specific distinctions.

Of Mr. Audubon's inaccuracies, I will not here speak at any length, nor am I willing to be suspected of any sympathy with those who have sought, on this account, to detract from the transcendent merits of the great painter and student of nature. While, however, we honor all that was excellent, we may at the same time, without disparagement to his great merits, correct whatever mistakes may have crept into his works, and even be pardoned if we enjoy a quiet laugh over some conclusions, now known to be visionary, but which his exuberant imagination, now and then, led him to put into printed words. We will take only one instance.

In his account of the common Black-Poll Warbler (*Dendroica striata*), we find the following eloquent picture of the delight with which he first discovered the nest of this bird: "One fair morning, while several of us were scrambling through one of the thickets of trees, scarcely waist high, my youngest son chanced to scare from her nest a female of the Black-Poll Warbler. Reader, just fancy how this raised my spirits. I felt as if the enormous expense of our voyage had been refunded. There, said I, we are the first white men who have seen such a nest."

It seems almost too bad to apply the touchstone of sober reality to so charming an evidence as is here given of the whole-hearted manner with which this enthusiastic lover of ornithology devoted himself to his mission,

His warmth and gratification have a touch of true poetry. But when we know that Mr. Audubon's whole party started in the expedition from Eastport, in Maine, where they also spent several days before they commenced their voyage to Labrador, and that one of his party was a near resident to Eastport; and when we further know that all around Eastport, and especially on the islands, the Black-Poll Warbler is one of the most common birds, we must see at once how far a vivid imagination has supplied the material for his conclusions, and that they had but little foundation in reality.

We will not dwell here any further upon the statements occurring in Mr. Audubon's writings, not consistent with the facts, as now known to us, for our limits do not permit, and the instance given above will sufficiently answer as an example of the mistakes into which his oversanguine temperament occasionally led him. His errors, we are sure, are never intentional; his statements of facts, when he tells us they are his own, we can rely upon: but when he accepts the information of others, or draws inferences from insufficient data, it is then that his accounts must be received with more caution, and that he exposed himself to the unkind and bitter attacks, in which those who do not appreciate his real excellences, or who are too intolerant of what are, after all, only venial faults, spots on the face of a great luminary, have too often indulged.

A few words on our own shortcomings, and we will close these desultory remarks. The Oölogy of North America, Part I., gives several illustrations which subsequent investigations show to have been not so well authenticated as they were supposed to be when published. They are: The egg given as that of the Goshawk (*Astur*

atricapillus), on the authority of a Western naturalist; that given for the egg of the Western Rough-Legged Hawk (*Archibuteo ferrugineus*), on the authority of the late Dr. Heermann; that of the Pigeon Hawk (*Falco columbarius*), the grounds for which supposition were given in full; and that of the Violet-green Swallow (*Hirundo thalassina*), on the authority of the late Dr. Webb.

Subsequent discoveries of well-authenticated eggs of all these birds, quite different from those figured, seem to show that in each instance there is an error in regard to their identity.

The egg figured for that of the Goshawk is, possibly, a very faint specimen of a Red-tailed Hawk's. The Swallow's egg may be that of *Hirundo lunifrons*, and that taken for the Pigeon Hawk's, that of a Cooper's Hawk. The egg given by Dr. Heermann as that of the Western Rough-leg, cannot now be determined. It evidently is not what it was supposed to be.

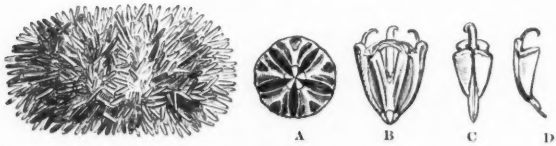
Without seeking to conceal the fact that four of the eggs figured in the Oölogy, appear not to belong to the places in which they are found, nor to wholly absolve the writer from so much of the responsibility as belongs to him, of having been led into errors by the mistakes of others, he may here state that in regard to the egg of the *Falco columbarius*, it was given as such at the time, with the full expression of grave doubts as to its authenticity. All the facts, all the contradictory evidence, were given with all possible care, and to the reader was given all the data in the writer's power, to enable him to form his own judgment. An English traveller, who was so fortunate as to procure specimens of undoubted eggs of this bird, has seen fit, in the pages of the

"London Ibis," to comment, with some impertinence, upon the want of good judgment shown in not accepting Mr. Audubon's testimony as positive, and as outweighing what seemed contradictory to it. It is a sufficient answer to all this, to here add that by not doing as this writer now suggests, supposing the case fully made out in favor of his views, another mistake was avoided. The egg figured and described by Mr. Audubon is, in my judgment, not that of this bird, but of the Sharp-shinned Hawk. My English friend was, therefore, a little fast, and his comments are not based upon quite so sure a foundation as he supposed. Another time, perhaps, he will confine himself to facts within his scope. In assuming that Audubon was *ex necessitate* right, he presumed beyond his ability to establish.

If, in the above pages, I have shown, however imperfectly, to all ornithological readers, how easy it is for the most careful and best intentioned to make mistakes, to be led into errors, to make wrong deductions, and to fail to see and to correct previous wrong conclusions; and if I shall succeed in impressing upon all students in Oölogy especially, the absolute need there is always of the most thorough identification of the bird to which their eggs belong, I shall have done all that I have sought to do. Never keep in your collection, except as a curiosity, an egg or nest which has not been identified. Above all, never guess at its parentage. Never name it without the most unquestionable evidence that you are right. While there are a few eggs that are unmistakable, there are more that you can never be sure of, save by positive knowledge of their parentage.

THE FOOD OF THE COMMON SEA-URCHIN.

BY J. W. DAWSON, LL.D.



THOUGH this creature* is so common on the north-eastern coasts of North America, the nature of its food does not seem to be generally known. In dissecting some specimens collected at Tadoussac, Canada, last summer, I found the intestine full of small round pellets, which proved to be made up of the minute confervoid sea-weeds that grow on submerged rocks, mixed with many diatoms and remains of small sponges. It would thus appear that the curious apparatus of jaws and teeth possessed by this creature is used in a kind of browsing or grazing process, by which it scrapes from submarine rocks the more minute sea-weeds which cling to them, and forms these into solid balls, which are swallowed, and in this state passed through the intestinal canal, where they may be found in all stages of digestion. The sea-urchin is thus a kind of submarine rodent, in so far as its habits are concerned. From these pellets the microscopist may, after digesting them in nitric acid, obtain great numbers of beautiful diatoms (or microscopic plants, for a long time classed with the Infusoria), which are collected by the animal with its food, and whose silicious crusts escape the digestive

*The cut represents the Common Sea-Urchin or Sea-Hedgehog (*Eurychinus drobachiensis* Verrill), one-third of the natural size. A, the eating apparatus seen from above, forming an inverted cone, the apex consisting of the cutting "teeth" or plates, which project out of the mouth-opening, as the animal moves mouth downwards. The five teeth move towards the centre during the act of eating. B, the same seen sideways. C, a single tooth, the lower point forming the cutting edge. D, the same seen sideways, the hook at the upper end with the other four, serving to retain the apparatus (sometimes called "Aristotle's Lantern") in place.

process. Though the sea-urchin is thus a vegetarian, yet near the fishing stations it may often be seen to feed greedily on the garbage of the fisheries, but I have not known it to attack living animals. I fancy that its mode of life at Tadoussac, where it is found in great abundance, may be taken as representing its natural habits, when remote from places where the offal of fisheries and similar matters may be found.

THE ROYAL FAMILIES OF PLANTS.

BY C. M. TRACY.

Those who study plants divide them into groups which they call families. This arrangement both expresses very closely the system of nature, and commends itself to the student as being at once pleasant to contemplate and easy to understand.

These families of plants are in one respect like those of men: they have their distinctive characters, and transmit them onward, from generation to generation, with great steadiness; but, as every likeness is apt to be balanced by a difference, these, unlike their human prototypes, never intermingle, but keep a lineal succession more pure and guarded than even that of the children of Israel.

In countries where the "divinity that hedges kings" is more readily admitted and revered than among us, mention is largely made of families termed "royal." By virtue of blood more pure, or strong, or ethereal, than runs in plebeian veins, these are supposed to furnish candidates for the diadem, whose claims are to be adjusted only by and among themselves, no competitor from without being recognized for a moment. Now without stopping to discuss the rights and wrongs of this question in the light of

political science, it is enough to observe, that these "royal families" have always attained their eminence, no doubt, through some high qualification of wisdom, courage, enterprise, or wealth. Some fortunate exhibition of a strong trait has compelled an acknowledgment of prerogative from the popular mass, and this advantage the recipients have been extremely careful to maintain.

On looking over the families of plants, we find royal ones there also. There are four relationships of this kind that tower above all the host that surround them.

> "He above the rest,
> In shape and gesture proudly eminent
> Stood like a tower."

Perforce, we must call them royal. The chief of the four is the family known as the Composites, or, as we prefer to call them, the Asterids.

The eminence of this vast group was very early recognized. The sagacious Ray had, by the year 1700, come to see its greatness so clearly, that, instead of a mere family, or order, he was willing to call it one of the primary divisions of the great Vegetable Kingdom. No other relationship unites such an enormous number of plants. Lindley, in 1853, reckoned the distinct species at nine thousand, and these as making one thousand and five secondary sets or genera. His estimate for the total of all known plants of every sort, is ninety-two thousand, nine hundred and thirty, so that, practically, we shall find just about one of these plants in every ten we may gather, taking the world over. There is no other case that affords any comparison with this. These plants are met with all over the globe, excluded neither from the tropics nor the arctic valleys, and taking rank and position, it seems, very much as suits them, irrespective of latitude. In Sicily, Presl found more than one to every other plant,

or more than half the whole flora of the island. In Majorca and its companion isles, Cambessedes says they are equally plenty. Humboldt reckons every seventh plant in France to be one, every eighth in Germany, and every fifteenth in Lapland; while in North America he finds one in every six, and on the same continent within the tropics, fully one half of the whole. The immense sweep of this family is not seen in location and numbers only. They possess every variety of stature and form. They are annuals, biennials, and perennials; the Daisy and Dandelion have no true stems at all, the Chamomile and the Cudweed are not two inches high, while the Composites of St. Helena are chiefly trees. The Hempweed climbs over bushes, and the Sweet Golden Rod lies flat on the ground. They take possession of all soils; the Marsh Fleabane demands the daily drenchings of the sea, the Dwarf Dandelion affects the dry shelves of rocky uplands, and the Sweet Everlasting is equally pleased with both. Among those of any given division, there is yet no restriction or fetter, for if we look at our garden annuals, we find the Golden Crepis making a mat upon the earth, and the great Sunflower, the most immense of annuals, throwing up its tree-like stem full of enormous flower heads, till, without a figure, "the fowls of the air may lodge in the branches thereof."

But how is this royal order to be recognized by the vulgar? How may the common, unbotanical eye, detect the badge of such a vegetable nobility? Not without some slight examination certainly, yet a slight amount is enough. They are called "Composites" or compound flowers, and this gives the strong point in the case in a word. A Pink or a Potato-bloom is *one flower*. It has only one set of organs composing it, and its fruit, wheth-

er pod or berry, is one and indivisible, though it may contain many seeds. So of the Apple flower and the flower of the Oak, and in short of every other flower whatever, except those of these *Asterids*. These reverse this rule entirely. What appears as one simple blossom in the Sunflower is really an assemblage of several hundreds. Every seed produced in the autumn had its separate and individual little flower, complete in all its parts; for no one of these originates more than one seed, and besides, there are some at the centre that never ripen their seeds, and also a row of broad-leaved, showy yellow ones round the margin that form no seeds at all.

Now these two features—the gathering together of many small flowers in one head, surrounded by a few green leaves, and the production by each flower of one seed and one only—these are two of the three marks that will identify this family everywhere. The third is rather more minute. In all perfect flowers, of every kind, there are two kinds of organs concerned in fertilization, and known as *stamens* and *pistils*. The latter always stand in the centre of the flower, and however numerous they may be, nothing is found interior to them. The stamens, on the contrary, are always more or less in a circle, immediately surrounding the pistils. A stamen consists, usually, of a knob more or less lengthened in its form, termed an *anther*, and borne on a thin stem called its *filament*. The reader need remember no more definitions just now. The third character of the Asterids then is, that in every one of their small flowers the five long anthers of as many stamens grow together round the one pistil, into a straight tube through which the pistil reaches; while the filaments, below the anthers, are wholly distinct.

So, then, the most unpractised hand may identify the

members of this most royal family by these three badges: 1, flowers collected into a compound head. 2, one single seed to each flower. 3, five anthers grown together in a tube round the pistil.

There are but three other families whose structure tends to confound them with these. These marks are even more decisive than the thick lip of the Hapsburghs. The five anthers of the Lobelids grow together just in the way described, but their flowers are never in heads, and their pods have many seeds. The Dipsacids, or Teazles, have flowers gathered in heads in exactly the manner of Composites, but the stamens are entirely free from each other throughout. Then there is a remarkable little family of herbs in South America, known by no common name at all, but we will call them Calycerids. They have small simple flowers in heads too, and single seeds, but the anthers are separate, or nearly so, while the filaments grow together instead. So there is very little need to mistake any of these several orders for the true royal line. The only plant that commonly meets us with any such delusive tendency is the Scabiosa, or Mourning Bride, of the gardens, which belongs with the Teazles. It grows and appears a good deal like a Composite; but if one looks in the centre of one of the small separate flowers, he sees the five stamens all perfectly distinct, and the thing is settled.

A very notable circumstance attending this family, and one going strongly to prove its royalty, is that its whole immense series produces hardly any food for man or beast. Lettuce, Dandelions, and Artichokes are the very best it can do in this way; of less account are Chicory and Salsify, hardly food at all, either of them. There are very few regal houses that boast of less utility. Medicines are not wanting among them; Arnica, Wormwood, and

Thoroughwort have a good reputation, and Chamomile flowers have scented the saddle-bags of every village doctor since the days of the Pilgrims. We will not forget, besides, that excellent oil is obtained from some; such a plant is largely raised in India for this purpose, where they call it Ramtil. Sunflower seed produces oil, it is said, but a species of Madia seems, according to experiments in Europe, to have great superiority as an oil-bearer. Pasquier informs us that it gives as much oil to the acre as Poppies, twice as much as Olives, and thirty-two parts where Linseed yields only twenty-one.

To those who love floral display, however, for its beauty alone, caring little for the degree of more material usefulness that may be found in connection, the great family of the Asterids is a perfect treasure-house. They swarm in every garden, they shine in every green-house, and no bouquet is complete without them. The Sunflower and Marigold bring their "barbaric pomp and gold," the Dahlia, a hundred hues and all splendid, forever tempting the gardener, and forever disappointing him; the Asters have piquant sprightliness, and the Daisies and Feverfews a pure and lovely modesty. Then we have Gaillardias, Pyrethrums, Humeas, Rhodanthes, Cacalias, Gazanias, Centaureas and Catamanches, some of which have common names, and more have none, all replete with beauty, and sure to be favorites wherever flowers are reckoned with the beloved. Nor must there be forgotten, at the end of all, just as "hale, concluding winter comes at last, and shuts the scene," the sterling Chrysanthemums, ever choice with the florist, ever grateful for the gardener's care, ever heedless of frost and chilly wind, and ready to bind a fresh wreath round the brow of the eldest December.

Thus much for the greatest of the Royal Families of Plants. Of the others we may speak hereafter. Their importance is not less than we have ascribed to these, and in some respects they far outvie the great division before us. From the study of their extended ranks we can but gain instruction; from their wonderful involutions there will still shine out a new light on the workings of that Spirit at whose bidding "the earth brought forth grass, the herb yielding seed, and the tree yielding fruit after its kind."

THE MOSS-ANIMALS, OR FRESH WATER POLYZOA.

PLATE 4.

BY ALPHEUS HYATT.

(Continued from p. 63.)

THE blood of the Phylactolæmata is colorless, resembling in this respect that of most of the lower animals. It is composed of the liquid products of digestion, which exude through the membranes of the stomach, diluted with water drawn in through innumerable pores perforating the wall of the tube. The water is the medium of conveyance for the gelatinous, nutritious liquid, probably facilitating its carriage to remote parts.

There is no organ resembling a heart to keep the blood moving, and there are no closed channels, such as arteries and veins, to conduct it among the tissues of the body. The absence of the first is supplied by cilia, which cover the interior of the tubes and cells with a dense, velvety nap, and by their unceasing vibrations sustain a healthy circulation. The course of this may be traced by the numerous floating parasites, beings of the simplest or-

ganization, consisting either of a single cell, or of larger cells containing many others, the cycle of whose lives is passed within the polyzoön, feeding upon its juices. These indicate the passage of a common stream up the branches, and a return current along the free side, which flows into each tube.

Our Polyzoön, also, has no breathing organs, neither lungs or gills to bring the blood in contact with the air, of which element there is always more or less in water, serving there as upon land, for the respiration of animals. The tentacles are supposed to be more especially devoted to this purpose, and the water admitted to the interior must necessarily purify the blood by the air it brings in, but nothing more definite is now known with regard to this function.

The Moss-animals have two modes of reproduction, one by buds, the other by eggs. The former occurs in two ways, by free buds or statoblasts, and by sprouting buds, which develop only in summer.

The statoblasts are destined to carry their burdens of vitality safely through the hardships of winter, and to perpetuate the race by founding new colonies in the spring. They appear at first in the shape of bead-like swellings from the centre of an organic cord, which connects the stomach with the cell (plate 3, fig. 4, and plate 4, fig. 1), passing between the bases of the muscles, which retract the tube. They begin as single cells, but these soon separate into two, then into four, and so on, indefinitely. The accumulated mass then presses to the outer surface of the cord, and becoming invested with a thick, horny, brown envelope (plate 4, figs. 2 & 3, w′), falls off at last into the cavity of the body. This horny sheath in some genera also acquires a solid ring, or an-

nulus (plate 4, figs. 2 & 4, w″), and in others, for example in Pectinatella (plate 4), may have the edge of the ring ornamented with delicate spines furnished with hooks.

Late in autumn the Polyzoön dies, and the statoblasts are set free to float during the long winter, the sensitive germ within being protected from the frost only by their tough coatings. They retain their vitality, however, until the warmth of returning spring awakens their suspended powers of growth. The young Polyzoön then increases in bulk, until it splits the sheath apart, and protrudes beyond the edges. The organs are well advanced when this takes place, and the tube has already acquired its adult habit of retracting the plumes upon the slightest provocation. Its youth is a sunny holiday passed in the open water, where it swims freely by the aid of cilia, which clothe the outer surface, but the sides of the statoblast are finally separated so widely, that they drop off, and the wanderer seeks a resting-place under some old log or stone. Here a little gelatine, which subsequently becomes the tough, brown envelope (plate 3, D), fastens it to the surface, and henceforth its fate is inseparably linked to that of an inanimate mass. When securely anchored, and in some cases while still free, a little bulb appears externally on one side, and, growing larger, stretches into a minute cell, within which a young polyzoön is discernable. This was primarily a tiny, saclike bud, formed by the bending inwards of the wall in the parent cell, close to the bases of the muscles of the fold (plate 1, fig. 5, Y). The throat and stomach are derived from the transverse division of the minute sac into two portions, but it remains to be ascertained whether the intestine is made by an after-growth from the stomach, or by the division lengthwise of the throat. The tentacles

arise from the thickened rim, and draw out between them a web, which afterwards receding externally, becomes the veil, and the wall of the tube is merely an elongation of the membrane connecting the rim of the sac with the parent.

The cell-bulb does not protrude externally until these organs are mapped out. The young one, though still very imperfect, begins to stretch forth its arms as soon as the cell, or cœnœcium, as it is more appropriately called, is well extended, and long before the characteristics reach perfection, gives other evidences of its natural precociousness in the statoblasts and regular buds, which spring up in their respective places within the cœnœcium. At intervals two buds will sprout in different directions, originating new branches, and thus a dendritic colony is gradually built up, which owes its origin entirely to one animal. Consequently the outer branches are the youngest, and often, as in plants, these are vigorous and quick with life, while the parent trunk is but an empty case, frequently with nothing left to indicate its position but the decaying cœnœcia, or their faint tracery in the slime.

The second mode of reproduction, by eggs, takes place only in the newly established colonies during the earlier summer months. These eggs are little colorless vesicles, developed internally from a bead-like swelling on the free side of the wall, near the orifice. When ripe they are dropped into the cavity of the cœnœcium, and there meet with the fertilizing filaments which have been developed from a similar bud upon the organic cord. We perceive from this that our polyzoön is, physiologically speaking, neither male or female, but of the collective gender, an hermaphrodite, combining the reproductive powers of both sexes.

The eggs eventually attain the size of a statoblast (about one-thirtieth of an inch long), and have an oval outline. When full grown, their exterior is also clothed with cilia, which render them capable of rapid motion, and at this period they may be sometimes seen squirming in the tube, and tossing the stomach about with great violence. No orifice for their emission from the body has been discovered, and we have every reason to believe there is none, and that they force their way into the world directly through the walls of the body. In fact, Mr. Albany Hancock, an English naturalist, has observed a full-grown egg, which obtained its liberty by pressing through the closed orifice of the cell, rending and destroying the parent in its course.

The cœnœcia, composing the trunks of the older colonies, are always empty, as previously stated, in the autumn, and it is not improbable that they are the remains of the unfortunate parents whose death was caused earlier in the season by their restless offspring, since all, even the younger autumnal polyzoa are incapable of bringing forth eggs, and produce only statoblasts and regular buds.

The polyzoön is developed from an internal bud at one end of the egg, and when sufficiently large bursts the outer envelope, coming forth like the polyzoön of the statoblast, armed with abundant cilia, by whose aid it swims. Like this, also, after a time its wandering ceases; it seeks some dismal retreat, glues itself to the surface, and becomes the progenitor of a new colony.

All Polyzoa, both marine and fresh water, in common with other attached and branching forms, such as the corals among the Radiata, have been called Phytozoa, or

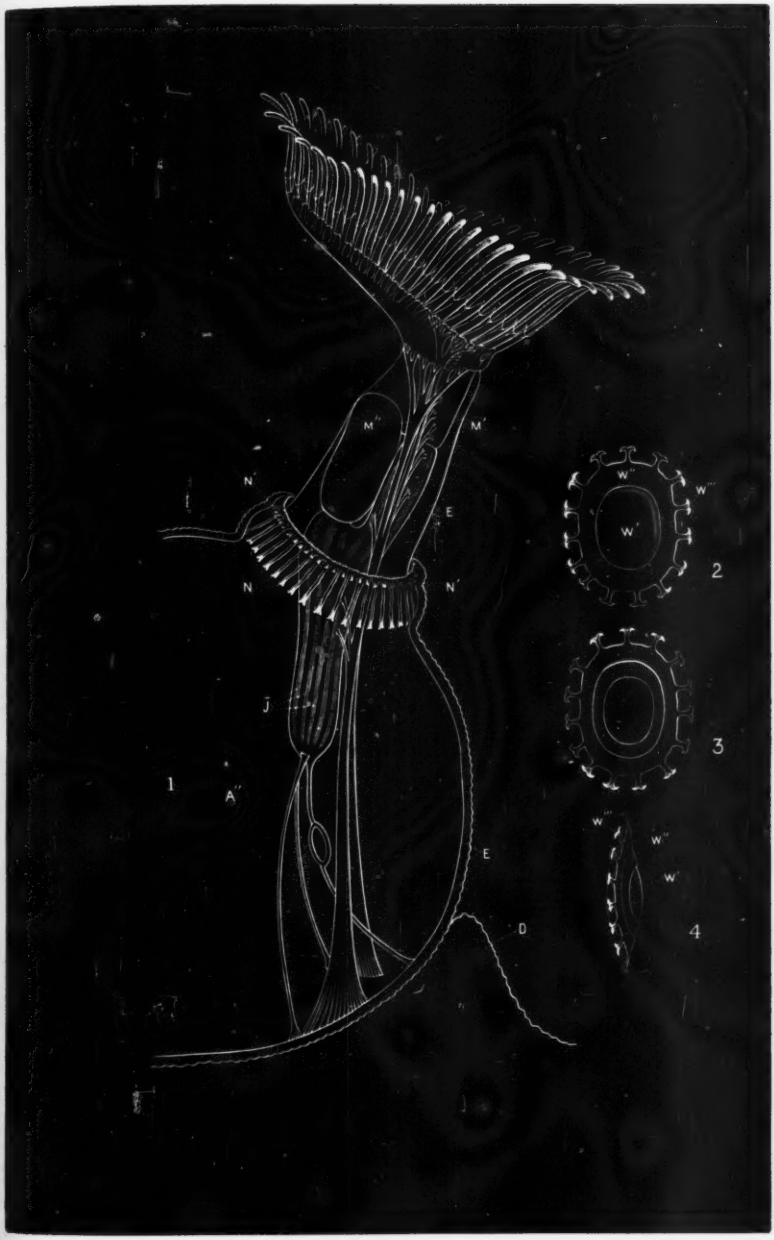
plant-animals, but, like all others of this kind, their young, born from the egg, are free.

Although thus resembling corals, they are widely separated from them by their structure. Each little animal, when reduced to its typical form, is a simple sac containing the stomach, and is allied to the clam, the oyster, and the snail, all of which have the same plan of structure. The coral, as may be seen by looking closely into any one cell, has a number of thin plates all pointing from the rim toward the vacant centre, like the spokes of a hubless wheel, and is, therefore, related to the star-fish, jelly-fish, and others, which have the parts arranged in a star-like or radiating manner. Thus, while by a process of budding, animals may be grouped into shrub-like colonies, with an external resemblance to each other and to the plants, with which the older naturalists classed them, their internal structure may show that they belong not only to animals, but to very distinct branches of the animal kingdom.—*Concluded in next number.*

EXPLANATION OF PLATE 4. *Pectinatella magnifica* Leidy.

Fig. 1. Enlarged view of one polyzoön, situated on the end of a branch, which in Pectinatella (see No. 2 of this Magazine) is only a hollow lobe. A″, cavity of this lobe; D, mass of gelatine below; E, wall of this lobe and tube; J, brown stripes in the stomach, the hepatic folds; M′, M″, muscles for withdrawing the tube, retractors; N, N′, muscles of the fold, which in this species is very narrow.

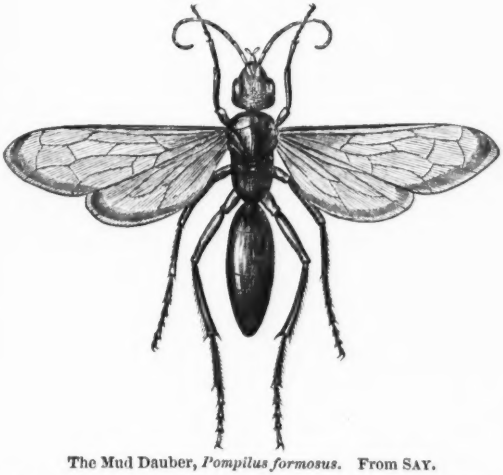
Figs. 2, 3, 4, the upper and lower side, and profile view of the statoblast; W′, horny sheath; W″, annulus; W‴, spines with hooks.



HYATT ON THE MOSS ANIMALS.

THE TARANTULA KILLERS OF TEXAS.

BY DR. G. LINCECUM.



The Mud Dauber, *Pompilus formosus*. From SAY.

An investigation of the extensive family of Mud Daubers would be an interesting and instructive study. It would necessarily include that of the various types of Spiders, from the great hairy Mygale Hentzii, down to the smallest, almost microscopic species; for nearly every type of Spiders has its special enemy among the Mud Daubers.

The large, red-winged "Tarantula Killer" (the *Pompilus formosus* of Say) is, as far as I know, the largest of the dauber group. It takes its prey by stinging, thus instantly paralyzing every limb of its victim. The effects of the introduction of its venom is as sudden as the snap of the electric spark. The wasp then drags it, going backwards to some suitable place, excavates a hole five inches deep in the earth, places its great spider in it, deposits an egg under one of its legs, near the body, and then

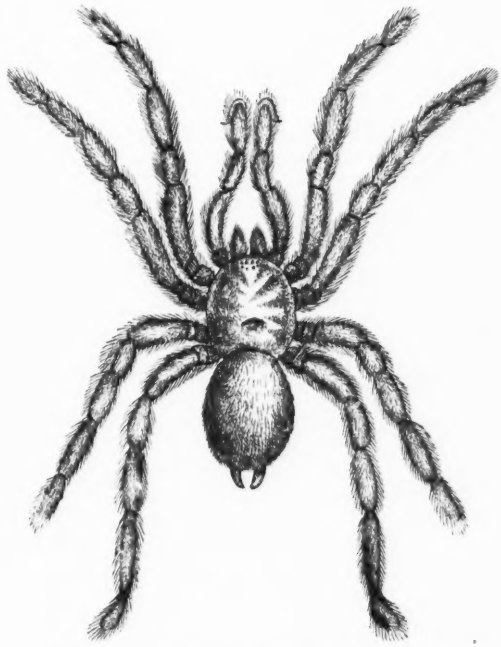
covers the hole very securely. A young Tarantula Killer will be produced from this egg, if no accident befalls it, about the first of June of the ensuing year.

This large and conspicuous insect is everywhere in Texas called the Tarantula Killer, and is over two inches in length; the head, thorax, abdomen, and long spiny legs are all black, while the wings are sometimes of a bright brown, with black spots at the tips. It is armed with a formidable sting, which it invariably uses in taking its prey. This sting does not kill the Mygale, but paralyzes it—suspends all animation—and in this state, in a dry place, and at the proper temperature, it is in a condition to resist decomposition a long time. The entire group of Mud Daubers possess the power of paralyzing their victims, and in that condition they store up their spiders, caterpillars, and other insects, which are to serve as food for coming generations.

The Tarantula Killer pursues several other species of the large ground spiders, but the Mygale Hentzii, or Tarantula, is his favorite.

I have sometimes found under shelving rocks, and other sheltered places, dauber's nests that were doubtless several years old. In some of the cells, where the egg had proved abortive, the spiders were there, still limber, with no signs of decomposition about them. They did not seem to be dead, but looked as if they could almost move their legs, and were perhaps not unconscious of their deplorable condition. I should be frightened at the prospect of being stung by any of the larger types of this group of insects. I have, however, known but a single instance of this kind. Several years ago a person was stung by a common black dirt dauber on the shoulder near the neck; he complained of numb-

ness in the part for a distance of some inches around the wound, but of no pain. Its effects lasted about twenty-four hours. I think it quite probable that the large Tarantula Killer would produce a more serious inconvenience, and perhaps paralyze the whole system. The



Mygale Hentzii, the Tarantula of Texas. From MARCY.

Pompilus, however, is a good-natured insect, showing no signs of pugnacity, except when she has a fine fat Tarantula in hand, and then she only threatens violence by spreading out her red wings, and running a little way

towards the intruder. She is quite tame, and will come familiarly in and about one's yard and house, dragging the prostrate Mygale under the floor, where she hides it from the intrusion of other Tarantula Killers, who would, if they could find it, take out the egg and put one of their own in its place, as they are remarkable for such thieving propensities.

The Mygale Hentzii, on the other hand, sometimes succeeds in capturing his great enemy, as I once noticed. When first observed, the Mygale had the Tarantula Killer, still alive, in his mouth, holding it by the back. The Tarantula seemed to be greatly elated at its success, which it manifested by capering about, and performing various other antics, such as running suddenly at any thing or person that came near it, holding on to his victim all the time. The Tarantula Killer appeared to be conscious of her condition, and was, as far as I could discern, fully resigned to her fate, remaining perfectly quiet. I regretted that I could not wait to witness the finale of this affair: such cases do not often occur.

The Tarantula Killers have severe fights with each other. It occasionally happens, when one of them succeeds in capturing a Tarantula, that another one, or more, flying around in that vicinity, and smelling the odor that arises from the Tarantula Killer when she uses her sting, which resembles the odor of the paper-making wasp (Vespa), only much stronger, takes the scent like a dog, tracks the Tarantula, following it up closely, and makes a violent effort to get possession of the paralyzed spider. A fight ensues, which occasionally terminates in the death of both parties; at other times the contest lasts but a little while, as the stronger party drives off the weaker, and takes possession of the prey.

It is surprising to one who has been educated to believe that the faculty of reason belongs alone to man, to contemplate the consummate ingenuity which is displayed by these insects in their efforts to secure their eggs from the observation of their own thieving sisters, and to hide the food they have provided for their young during the period of its existence under ground.

The Tarantula Killer feeds upon the honey and pollen of the flowers of the Elder, and of *Vitis ampelopsis*, the Virginia Creeper; but its favorite nourishment is taken from the blossoms of Asclepias quadrifolium. This species of Asclepias blooms through the summer, and the Tarantula Killer seems to know the locality of every plant. If one finds on the prairie a plant of Asclepias quadrifolium in bloom, and watches ten or fifteen minutes, he will be almost certain to see a Tarantula Killer come to it. This insect requires considerable food, as its period of life extends from the first of June until November, or till the frost destroys all the flowers, when it seems to die for want of food, as it is often seen at this time crawling about in a very feeble state. I do not think any of them ever survive the winter, as they never appear earlier than June.

THE BIRDS OF SPRING.

BY J. A. ALLEN.

THE arrival of our birds during the spring is by no means uniform; a certain number coming one week and an equal number the next, either in the accession of species or individuals; nor is the increase regular and uninterrupted. At first the comers are uncertain, both as regards number and the time of arrival. The few that

appear in March would scarce attract attention if appearing with the hosts of May, while now the animation they afford our fields and roadsides is in agreeable contrast with the dearth of bird life in winter. April brings larger additions, and May bursts upon us with such a profusion of species, that on all sides we are greeted with fluttering, restless wings and lively notes. But the increase has its intermissions; the first genial period attracts a few, but through the succeeding colder weather their numbers for weeks may scarcely increase, perhaps, indeed, if the cold prove quite severe, actually decreasing, while a following unusually mild term hastens on many that seem to have been awaiting a favorable opportunity. A cold norther occurring early in May, impedes for days the thousands of Warblers and Flycatchers that are accustomed then to migrate. The storm perchance closing at nightfall, a mild night ensues, and with the next day's sun the woods are alive with little industrious insect hunters, that the day before the most prying observer would fail to have detected; they increase with the advance of the day, and towards night the collector finds some species common, that he had looked in vain for in the morning, and the hedges suddenly become vocal with their notes.

Our limits would not allow us even to enumerate all the insectivorous species,—the friends of the orchardist, the gardener, the farmer, in short, of our race,—and much more to describe their pleasing colors, their inspiriting songs, and their hundred interesting peculiarities of habit and mode of life; how some hunt their prey, creeping among the foliage, others pursue it in the air, or suddenly dart upon some unlucky insect as it passes their perch. Among the woodland species the very names of the warblers,—the Black-throated Blue, the Black-throated

Green, the Chestnut-sided, the Bay-breasted, the Yellow Red-poll, the Black-poll, the Nashville, the Cape May, the Golden-crowned, the Orange-crowned, the Blackburnian, the Golden-winged, the Spotted Canada, the Redstart, etc., some of them scarce, but most abundant for a brief period in May,—are suggestive of all that is beautiful in birds: gay plumage, useful habits, and sweet warbling notes.

Among the more common and well known later emigrants, we welcome the Bobolink to our meadows, which he alone would render attractive. Brimful of animal spirits, he gaily fiddles away all the day long, perched on some tree or fence in his favorite bogs and meadows, or indulges in coquettish gambols in the air, meeting us in our walks as we approach his grounds with a confident outburst of tinkling drollery, so varied and fanciful we half imagine it to represent personal allusions of either flattery or derision. We welcome the gorgeously colored Oriole, and the chaste-robed Vireo to the orchard, where the loud trumpet notes of the former, and the soft, soothing warble of the latter, render them as agreeable as their services are valuable to the fruit-grower. We also welcome the Red Mavis, or Brown Thrush, to the hedges, the clear-voiced Veery to the swamps and moister woodlands, the twittering swallows to their homes under the eaves and in the barn lofts. Not least valued by lovers of the picturesque is the Whippoorwill, which, from the roof, the well-curb, the door-yard fence, or the remoter precincts of the woods, is heard during morning and evening twilight, or at intervals throughout the moonlit night.

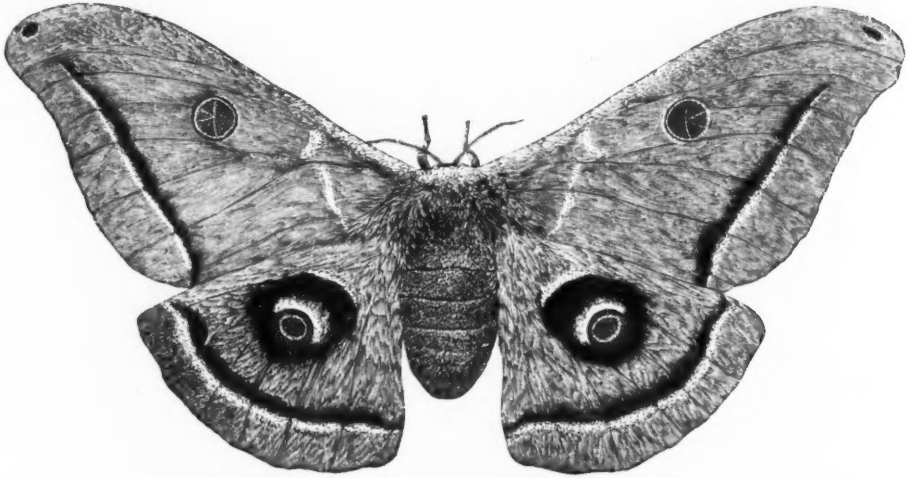
During the spring months we have with us nearly every species of bird that ever visits us during the entire year, embracing of course all the resident kinds, as well as all the migratory, except a few transient winter visitors;

even the greater part of these latter may be found, if not every year, at least occasionally during the early part of March. The migratory species constitute two classes, according to their range in the breeding season, viz.: those species that spend the summer with us, and those that altogether pass farther north. Compared with the birds of winter, they embrace a very much greater proportion of common species, while nearly all are regular, if not abundant visitors. The proportion of rare species is but thirty-five and one-half per cent., instead of seventy-six per cent. as in winter. The number of rapacious species has hardly increased, but the insectivorous, instead of being extremely few, now constitute, taking only those strictly insectivorous, fully one-half the whole, and the diet of this remaining half (especially among the land birds) is mainly composed of insects.

Such are some of the changing phases of bird life in our varied climate. In the following tabular statement we give a further summary.*

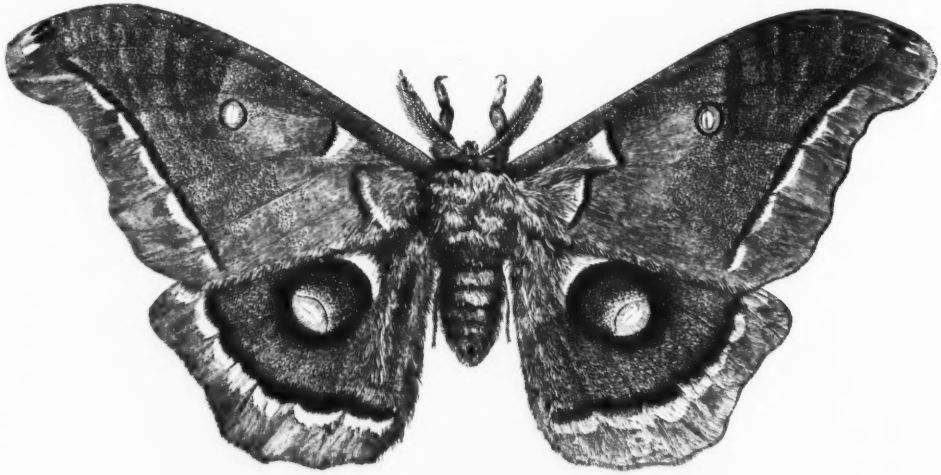
Whole number of species (in Spring),		280
Common, " "		190
Rare, " "		90
Migrant, " "		250
Resident, " "		30
Migrants that spend the summer in Southern New England,	Land Birds, 136	
	Water " 36	
		172
Migrants that pass the summer farther north,	Land Birds, 28	
	Water " 80	
		108
Birds of Prey (number of species),		18
Cuckoos, Woodpeckers, Night Jars, and their allies,		15
Flycatchers, Thrushes, Warblers, Swallows, Vireos, Wrens, etc.,		77
Finches, Orioles, Blackbirds, etc.,		40
Pigeons and Grouse,		6
Herons, Plovers, Sandpipers, and Rails,		50
Ducks and Geese,		37
Gannets, Gulls, Shearwaters, Terns, etc.,		22
Divers, etc.,		13

*Designed for the North-eastern States of the Union.



FEMALE OF THE AMERICAN SILK WORM.

TELEA POLYPHEMUS.



MALE OF THE AMERICAN SILK WORM.

TELEA POLYPHEMUS. [After HARRIS.]

THE AMERICAN SILK WORM.

BY L. TROUVELOT.

(Concluded from p. 95.)

Rearing of the larva in the open air. There are different ways of raising the wild silk worms. I have for two years cultivated them in the open air. I had about five acres of woodland enclosed by a fence eight feet high; a net was stretched over the bushes, which were of six or eight years' growth. This net, supported upon posts, was intended to protect the worms from the depredations of the birds. The eggs were put upon the bushes in the little hatching-box, so that after this, there seemed but very little to do. But it was not so: over so large a space, it was impossible to keep the net in good order, and the birds managed to get under it; the small ones could go through the meshes, and the larger ones through some holes in the old net, so I was obliged to chase them all the day long, as when pursuing them on one side they would fly to the other and quietly feed, until I again reappeared. Thus, besides the insect enemies enumerated above, many of the caterpillars fell a prey to the birds.

Rearing them under a shade. This year I made a shade open on all sides, protected by a roof to keep out the hot rays of the sun, and boards were arranged so that they could be raised up from the roof to give more light when the sun was behind the clouds, and also at morning, evening, and at night. This shade had a very fine net around it, so that it was impossible for the birds to get through the meshes. In this way an oak branch can be kept fresh for four or five days; a branch is placed in every two holes, so as to leave a vacant one between any two branches. When the foliage of one branch is nearly eaten up, a fresh one is put into the vacant hole, and small

twigs, going from the old branch to the fresh one, are placed so that the worms can cross upon it without descending upon the table. When the worms are attached for the purpose of moulting, they should not be disturbed or taken away from the place where they are, as they could not so easily change their skin. Three times a day the excrements should be swept from the table. In warm days some water should be sprinkled with a watering-pot upon the leaves, as the worms are fond of drinking water. The worms should be handled as little as possible, and only when it is absolutely necessary. The space that remains open between the branch and the table should be filled with paper or hay, so that the larvæ may not crawl under the table, as they would be drowned in the water contained in the bottle.

For cultivating Silk Worms upon a large scale, it would be very well to select a place with a brook running through it, as the water could be made to flow under the table, in reservoirs, where the branches could always dip in fresh water; as the water put in the bottles is soon corrupted, and the branches absorb much of it, they need to be filled up several times a day.

When a cocoon is well begun, the best way will be to separate from the branch the twig and leaves between which it is built, so that other worms will not disturb the larvæ working inside; this cocoon should be placed upon lines stretched for that purpose in a special room, where the sun cannot reach it. Ten or twelve days after, they will be completed, and may be placed in baskets, and kept as I have indicated above.

Some experiments made on our Silk Worm show how hardy it is, being the easiest of all the silk worms to take care of. Chrysalids were put into a tin box,

which was placed in another box containing ice and salt; the temperature soon descended to four degrees below zero. They were allowed to remain in this refrigerator for half an hour. When taken out, the chrysalids were as hard as a piece of ice; they were immediately put into a cold room. Several days after this, the temperature of the room being above the freezing point, the chrysalids gave signs of life by moving the abdomen. Some years ago, wanting to keep a cocoon in my collection, I thrust a pin through it, and it passed through the body of a living chrysalis inside of it; this was done in the month of October. Nine months after, in June of the following year, I was astonished to find a great commotion in one of the boxes of my collection; all the specimens were broken, and I found the cocoon which had been pinned in the box, detached and open at one end, and the antennæ, head and legs of the moth projecting out of it; the insect was still living and could not come out, as the pin passing through it had also transfixed the cocoon. Through this insect had been thrust, for nine months, a pin covered with verdigris, and yet had not been killed by it! Naturalists state that it is very important, when transporting cocoons in a box, to pierce the box with holes so that the air may penetrate it, as if air was needed for a chrysalis inside the cocoon. Having observed how close and air-tight the cocoon of the Polyphemus seems to be, I could not conceive that air was needed for it to breathe. Desirous of ascertaining whether my idea was correct, I took three cocoons, and at two different times I covered them carefully with a thick coating of starch, allowing the first coating to dry before putting on the second one. After this the cocoons were covered at three different times with a heavy coating of shellac varnish; thus the cocoons

were made perfectly air-tight. They were kept in a cold dry room all winter. In July the moths came out perfectly healthy, the fluid they discharge through the mouth having perfectly dissolved the starch and varnish. So these insects had been nine months with no air, except the very small volume enclosed in the cocoon, and they had accomplished their transformation just as well as if the air had been allowed to come into the cocoon.

It seems to me that when once enclosed in the cocoon, the pupa is in a transitory state. The process of assimilation, at least during the cold days, seems to have ceased. In the stomach of chrysalids can be found an albuminous, greenish substance; probably it is a food which can be assimilated, or at least transformed into some of the liquids which are discharged by the perfect insect when coming out of the cocoon. If there is any elaboration of the food in the chrysalis, the process must be very slow, and surely no air is needed to accomplish it, nor any food, except what little food is in the stomach. The most striking phenomena manifested by life is the assimilation and elimination of food; but to assimilate, the animal must take food, either in the solid or gaseous form. We know that the chrysalis cannot eat; breathing is very problematical. Before changing into a chrysalis, the worm evacuates all the contents of its stomach; so, in my opinion, the chrysalis does not breathe, or if at all, it is so very slight as to be insignificant.

There is not much possibility of being able to obtain two broods of the Silk Worm in the same year in this latitude. The earliest date at which I have obtained cocoons was the first of August, twenty-two days after the moth hatched from the cocoon. On the fifth of September I had young larvæ, but the heat being less in this

month than in July and August, the larvæ did not grow so rapidly, and the moulting did not take place so regularly. The first moulting took place on the fourteenth day, the second the twenty-third day, the third the thirty-sixth day; on the first of November, or fifty-six days after their birth, they had not accomplished the fourth moulting. I could not continue the experiment, as I left for Europe the second of November; but they had frozen several times, and the leaves were very hard, in fact I do not believe that the second brood would have come to maturity. I do not see that it would be of any advantage to obtain two broods, as the moths do not all come out of the cocoon at the same time, but sometimes there are two months between the first and the last; so the process of rearing can go on permanently all summer, which is equal to having two broods.

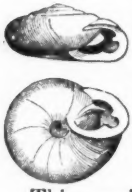
Cocoons can be retarded in hatching out by being put in a very cold room—an ice-house, for instance; in this way they can be made to hatch another year, or nearly twenty-one months after they have been in the cocoon. In fact, the time of their appearance can be put back for an indefinite period, as life is nearly suspended. Reaumur states, that, at the time he was writing, he had in his cellar pupæ which had been there for five years, which were still living. I have myself kept pupæ of sphingidæ, or hawkmoths, for three years in my cellar. At the time I went to Europe, they were still living, but on my return I found that the rats had eaten them.

THE LAND SNAILS OF NEW ENGLAND.

BY EDWARD S. MORSE.

HELIX TRIDENTATA *Say*. (Figs. 8, 9.) The shell of this species is depressed, and of a yellowish horn color; whorls five or six, slightly convex. Aperture contracted by the reflected lip, which has two teeth, and with a curved tooth on the inner lip forms a trilobed aperture. The whorls are obliquely striated, and the umbilicus is open. Diameter about one-half an inch. The animal is of a dark bluish slate color.

Figs. 8, 9.



This species is widely distributed throughout the United States, but is not common in New England. It has never been found in Maine, or New Hampshire, or in the eastern part of Massachusetts, and occurs only rarely in the western part of the last-mentioned State. Dr. Binney states that he has most commonly found it under layers of wet and decaying leaves in forests.

HELIX PALLIATA *Say*. (Figs. 10, 11.) Shell depressed, dark brown or chestnut color, covered with minute stiff hairs which give the surface a roughened appearance. Whorls five, flattened above; aperture three lobed, much contracted by the lip and teeth. Lip widely reflected, with two projecting teeth on the inner margin; the one at the base long and slightly prominent, the one above acute and prominent; inner lip having a broad white tooth projecting downward from the shell; umbilicus covered by a white callus, being an extension from the lip. Diameter nearly one inch. Animal blackish slate color. It is found in Vermont at Copperas Hill, and is common in the

Figs. 10, 11.

Western, South-western, and Atlantic States, with the exception of New England, as far south as South Carolina.

HELIX MONODON *Rackett*. (Figs. 12, 13.) Shell light russet in color; whorls five or six, closely revolving; aperture flattened, contracted by a deep groove behind the lip. The lip is narrow, and turned back, partially or wholly covering the umbilicus. On the inner lip there is a long white tooth at the aperture, and within the aperture, projecting from the umbilicus, a shelly partition called the fulcrum. The shell is covered with numerous minute hairy projections, which give the surface a velvety appearance. The diameter of the shell is usually three-eighths of an inch. Animal yellowish-brown, darker on the head and back. In some parts of New England this species is quite common. Found in forests and also on hill-sides in pastures, under bits of bark and stones, a situation in which it is unusual for other snails to occur. Two or three individuals are generally found together.

Figs. 12,13.

HELIX HIRSUTA *Say*. (Figs. 14, 15.) Shell nearly globular, brownish in color, covered by numerous rigid hairs. Aperture contracted, and nearly closed by a long narrow tooth on the body whorl; lip narrow, turned against the outer whorl. On the inner margin of the outer lip, at the base of the aperture, is a deep notch. Ordinary diameter one-quarter of an inch; umbilicus closed. Animal whitish, head and tentacles slate colored. In the New England States this species has been found west of the Connecticut River, though not common. It is common in the Middle and Western States. — *To be continued.*

Figs. 14,15.

NOTE. — In explaining the parts of the shell in the first number, Fig. 1, the following references were accidentally omitted: A, *aperture*. T, a shelly projection within the aperture, called the *tooth*.

REVIEWS.

OBSERVATIONS UPON THE CRANIAL FORMS OF THE AMERICAN ABORIGINES. By *J. Aitken Meigs, M. D.* Philadelphia, 1866. pp. 39. 8vo.

The valuable observations here recorded are based upon the large collection of skulls belonging to the Academy of Natural Sciences at Philadelphia, largely consisting of the celebrated Morton collection. The author's conclusions, however, derived from a study of this and other materials, lead him to state that "it becomes very probable that there is for the American variety of man neither unity nor genetic isolation." It is well known that Dr. Morton advocated strongly the diversity of the origin of Man, and the uniformity of the American type of skulls; i. e., that the Indian is a distinct species from the Esquimaux, Negro, or Caucasian, and was created on the soil he now inhabits. But M. Alcide D'Orbigny, with his observant eye and rare experience as a traveller in South America, contended that the races he saw there were as diverse as those of Europe. This view, extended to all the American races, was shared by Blumenbach, Lawrence and Pritchard, and others, especially Dr. Desmoulins and Bory de Vincent, two French Ethnologists.

More recently, the late Prof. Retzius, a Scandinavian ethnologist of high standing, criticised Dr. Morton's views, saying that "there is scarcely any part of the world where such contrasts are to be found between *dolichocephali* (long-headed skulls) and *brachycephali* (short or square-headed skulls) as in America!" Dividing the American races into three types, he "traces the pedigree of the Esquimaux into Asia, among the Chinese population, the transitionary link being the Aleutians. The dolichocephalic Indians (our eastern tribes) he assumes to be related to the Guanches of the Canary Islands, and the Atlantic tribes in Africa, as the Moors, Berbers, Tuaricks, Copts, etc., which are comprised under the Amazirgh and Egyptian Atlantidæ of Latham. The American brachycephalic tribes which belong chiefly to the side of America looking towards Asia, the Pacific Ocean, and the South Sea, are allied, he thinks, to the Mongolian nations." D'Omalius d'Halloy, Latham, and, more recently, Wilson, the author of "Prehistoric Man," have stated their belief in the diversity of the American races.

Our author gives many facts of much interest to the special student, and thus sums up his conclusions:—*

1st. That the crania of the Aboriginal Americans are divisible into Dolichocephalic, Mesocephalic, and Brachycephalic groups.

2d. That the Dolichocephali greatly preponderate in numbers over the Mesocephali and Brachycephali.

*Human Skulls are divided by Ethnologists into two categories; namely, those that are long and high, *dolichocephalic*, and the square, short forms, called *brachycephalic* crania. The author uses the term *mesocephalic*, to signify a form of skull that is a medium between the two primary forms.

3d. That in the case of the Peruvian skulls in the Academy's collection, however, the short, square heads are more numerous than the elongated forms.

4th. That in North America neither the Dolichocephalic nor Brachycephalic tribes, when first known to Europeans, were restricted in their geographical distribution to any particular locality. While the former were scattered over the continent, through all degrees of latitude and longitude; the latter appear to have been, if we may judge from the specimens in the Museum, more numerous about the Great Lakes, at various places in the interior, in the south near the Gulf of Mexico, in the so-called Paduca area, and especially along the north-west coast. In general terms we may say that on the eastern or Atlantic side of the continent the Dolichocephali appear to have prevailed; and on the western or Pacific side the Brachycephali. This, in a great measure, seems to have been, and still is, the case in South America.

5th. That long and short-headed tribes or races are very commonly found throughout the two Americas side by side. In the extreme north, for example, dolichocephalic and brachycephalic forms are contrasted in the Esquimaux and their geographical neighbors, the Konaegi or Kadiakan Aleutians: and again in the far south these diverse forms are exhibited in the Patagonians and Pueiches.

6th. That this contrast in cranial forms existed among the extinct races of America, as it now does among extant tribes.

7th. That in comparing the old and new worlds by their cranial forms, we find that while in Europe and Asia the brachycephalic is the prevalent form, in North America the dolichocephalic is the predominant type.

8th. That while in Africa all the people are dolichocephalic, in South America they are nearly equally divided between the long and short forms.

9th. That while in Europe and Asia the Polar or Arctic people are chiefly brachycephalic, in America they are wholly dolichocephalic.

10th. That various European, Asiatic, and African crania, such as those of Norwegians, Swedes, Anglo-Saxons, the Germanic or long-headed Germans, the Gothic or short-headed Germans, the Finns, Lapps, Turks, Sclavonians, Kalmucks, Burats, Prognathic Negroes, etc., find representatives among the native cranial forms of America.

11th. That this homolocephalic representation is not confined to normal skull-forms, but is shown in abnormal or artificially distorted skulls also.

12th. That the Dolichocephali are divisible into at least six well-marked forms or types; namely, the pyramidal, boat-shaped, oval, cylindrical, oblong, and arched.

13th. That the Brachycephali may be divided into round or globular, and square or cuboidal classes.

14th. That the Mesocephali also consist of two sub-groups, one of which is transitionary to the square or cubical, and the other to the round or globular Brachycephali.

15th. That these ethnical or typical groups are founded upon osteological differences as great, and apparently as constant, as those which, in Europe, suffice to separate the Germanic and Celtic stocks, on the one hand, from the Ugrian, Turkish, and Sclavonian, on the other.

A TREATISE ON SOME OF THE INSECTS INJURIOUS TO VEGETATION. By *T. W. Harris, M. D.* Third Edition. Boston. Crosby & Nichols.

The publication of this work, aside from his strictly scientific papers, secured to the author a high reputation as an entomologist, as he was one of those few naturalists who specially studied the *habits* of insects, as well as their structure and classification. So richly illustrated a volume, aside from its great value as being the best introduction to American Entomology, and as forming a practical treatise on our noxious insects, must always claim for it a large circulation. We owe to the courtesy of the Editor the privilege of using several illustrations, which are duly credited in their appro-priate places.

NATURAL HISTORY MISCELLANY.

BOTANY.

THE "MAY FLOWER."—Among all that beautiful family of plants, the Heaths, there is none that has such strong claims upon our regard as the lowly May Flower, and none more likely to have its claims vindicated; for, to a certain extent, it has already become historical, in conquence of its association with the Pilgrims, or more properly with the Pilgrim ship "May Flower." This humble shrubby plant grows plentifully around Plymouth, and in piney woods in many other localities along the New England coast. Its "starry loveliness" could hardly have failed to arrest the attention of our worthy forefathers, whose high purposes and imperative necessities left so little room for the play of sentiment. Even in that austere age, we doubt if it were frowned upon, as much of a sin, if the young Puritan, on his way to the meeting-house, chanced to tuck a sprig or two into his doublet, in expectation that the eyes of some Mary or Martha, who perchance sat on the opposite bench, weary perhaps with watching the slow-moving sands of the hour-glass on the pulpit,—might look the more graciously upon him.

In the books, this plant is known as the "Epigea repens," but otherwise as the Trailing Arbutus, May Flower, and Ground Laurel. Under whatever name, however, it is sweet and lovely, and has such a rich, spicy fragrance, that we wonder how the fickle suns of April could possibly draw from the cold ground aroma of such delicacy.

Pretty little branches of this early gem may now be purchased along the thoroughfares, and at the flower-shops of Boston. Sweet harbinger of Spring, pleasing souvenir of the season, go on your mission of gladness, as young men and maidens, old men and children welcome your return, and bear them away to homes of affection and regard, laden with whisperings of joy to the young, hope to the afflicted, rest and peace to the weary and aged; to homes where every one, as in the words of a certain poet of New Bedford, may be strengthened and confirmed in every good impulse of patriotism and devotion!

"Dear to my heart, thy rock-ribbed hills,
Thy valleys green, thy gentle rills,
Thy sunny nooks, where 'neath the snows,
The fragrant Epigea blows.
And tempts, 'ere winter yields her sway,
The blooming maidens steps away,
In many a wooded warm recess,
To seek its starry loveliness."

G. D. P.

PARTHENOGENESIS IN THE WEEPING WILLOW.—Herbert Spencer, in "The Principles of Biology," states that the Weeping Willow multi-

plies for an indefinite period by *agamogenesis* (or birth without a previous union of the male and female elements). This tree, "which has been propagated throughout Europe, does not seed in Europe."

On the Period and Ratio of the Annual Increase in the Circumference of Trees.—"The Carolina Poplar (*Populus monilifera* Ait.) was selected on account of its rapid growth, enabling me to easily note the increase of circumference each seven days. The results tabulated, show that—

"The tree increased in growth only during the three months between the middle of May and the middle of August, and that the ratio of growth is much greater during the month between the middle of June and the middle of July, than during the month preceding, and the succeeding months."—T. Meehan, *Proceedings of the Academy of Natural Sciences, Philadelphia, October*, 1866.

The Agency of Insects in Fertilizing Plants.—I have made some observations and experiments on the fertilization of Phænogamous Plants, showing that in the genus *Kalmia*, and other genera also, insects are necessary to carry pollen from flower to flower in order to fertilize pistils.

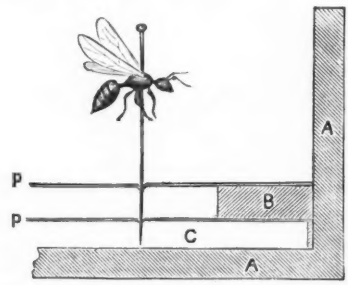
I have found, also, that of many plants which produce perfect flowers, in some the stamens discharge all this pollen before the stigmas of the same flower are exposed; while there are others in which the pistil is fertilized before the pollen of the flower is discharged. In these two ways they act as though they were monœcious plants.—W. J. Beal.

Curious Flower.—One of the most singular flowers growing in this pretty garden (of the Panama Railway Company) was an orchid, called by the natives "Flor del Espiritu Santo," or the "Flower of the Holy Ghost." The blossom, white as Parian marble, somewhat resembles the Tulip in form; its perfume is not unlike that of the Magnolia, but more intense. Neither its beauty nor fragrance begat for it the high reverence in which it is held, but the image of a dove placed in its centre. Gathering the freshly-opened flower, and pulling apart its alabaster petals, there sits the dove; its slender pinions droop listlessly by its side; the head inclining gently forward, as if bowed in gentle submission, brings the delicate beak, just blushed with carmine, in contact with the snowy breast.—J. K. Lord's "*The Naturalist in Vancouver Island.*"

ZOÖLOGY.

Mimetic Forms among Insects.—Among the living objects mimicked by insects are the predaceous species, from which it is the interest of the mimickers to be concealed. Thus, the species of Scaphura (a genus of Crickets) in South America resemble, in a wonderful man-

ner, different Land Wasps of large size, which are constantly on the search for crickets to provision their nests with. Another pretty cricket which I observed was a good imitation of a Tiger Beetle, and was always found on trees frequented by the Beetles (*Odontocheilæ*). There are endless instances of predaceous insects being disguised, by having similar shapes and colors to those of their prey,—many Spiders are thus endowed; but some hunting Spiders mimic flower-buds, and station themselves motionless on the axils of leaves and other parts of plants, to wait for their victims.—H. W. BATES, *Linnæan Transactions*, 1862, p. 509.



A NEW INSECT BOX.—The necessity for a cheap, and efficient insect box, has long been experienced by collectors. Sheet cork is not only expensive, but oftentimes difficult to procure; linings of pith require a good deal of management to make neat and even surfaces. The following plan is offered, after testing its merits for several years, not only in cases used for the transportation of specimens, but in those intended for permanent exhibition. A box is made of the required depth, and a light frame is fitted to its interior. Upon the upper and under surfaces of this frame, a sheet of white paper (drawing, or log paper answers the purpose) is securely glued. The paper having been previously dampened, in drying contracts and tightens like a drum-head. The frame is then secured about one-fourth of an inch from the bottom of the box, and the pin is forced down through the two thicknesses of paper, and if the bottom of the box be of soft pine, the point of the pin may be slightly forced into it. It is thus firmly held at two or three different points, and all lateral movements are prevented. Other advantages are secured by this arrangement, besides firmness; when the box needs cleaning or fumigation, the entire collection may be removed by taking out the frame; or camphor, tobacco, or other material can be placed on the bottom of the box, and concealed from sight. The annexed figure represents a transverse section of a portion of the side and bottom of the box with the frame. A, A, BOX. B, frame. P, P, upper and under sheets of paper. C, space between lower sheet of paper and bottom of the box.—E. S. MORSE.

HABITS OF THE CARPENTER BEES. — I send specimens in alcohol of the pupa of *Xylocopa virginica*, the Carpenter Bee, with the pupæ of *Anthrax sinuosa*. The latter fly I take to be a parasite of the Carpenter Bee. I found them occupying alternate cells or divisions in the mines of the Xylocopa. *Ceratina dupla*, a little green bee, allied to the Carpenter Bee, is now (May 18) busily boring and laying its eggs in almost every variety of pithy stems, such as the Elder and Syringa. — JAMES ANGUS, *West Farms, N. Y.*

PARASITES OF THE HUMBLE BEE. — I have lately obtained four specimens of a moth, *Helia Americalis*, from a Bombus nest kept since last fall in a flower-pot, covered with a glass. — *Ib.*

GEOLOGY.

ON THE ABSENCE OF THE NORTHERN DRIFT FORMATION FROM THE WESTERN COAST OF NORTH AMERICA, AND FROM THE INTERIOR OF THE CONTINENT. — Prof. Whitney made some remarks on the absence of the Northern Drift formation from the western coast of North America, and from the interior of the continent, throughout the region to the south-west of the Missouri River.

The term "Northern Drift" is understood to include the masses of unstratified detrital materials and boulders which have been transported and distributed by some general cause, independent in a great degree of the present conformation of the surface and of the direction of the existing river courses. The investigations of geologists have shown that the surface of Canada, New England, and the States north of the Ohio and north of the parallel of thirty-nine degrees, as far west as the Mississippi, and even for some distance beyond it in that direction, are covered by detrital materials which have been carried from the north towards the south, and often for a great distance and in immense masses.

The explorations of the Geological Survey of California have demonstrated, however, that there is no true Northern Drift within the limits of this State. Our detrital materials, which often form deposits of great extent and thickness, are invariably found to have been dependent for their origin and present position on causes similar to those now in action, and to have been deposited on the flanks and at the bases of the nearest mountain ranges by currents of water rushing down their slopes. While we have abundant evidence of the former existence of extensive glaciers in the Sierra Nevada, there is no reason to suppose that this ice was, to any extent, an effective agent in the transportation of the superficial detritus now resting on the flanks of the mountains. The glaciers were confined to the most elevated por-

tions of the mountains, and although the moraines which they have left as evidence of their former extension are often large and conspicuous, they are insignificant in comparison with the detrital masses formed by aqueous erosion. There is nothing anywhere in California which indicates a general glacial epoch during which ice covered the whole country and moved bodies of detritus over the surface, independently of its present configuration, as is seen throughout the North-eastern States.

The same condition of things prevails in Nevada and through Oregon, as far as explored by the members of the Survey. The detritus seems always to be accumulated at the base of the mountains — gravel, boulders, and sand lying below and not far distant from the bed of rock of which these materials once formed a part, and from which they appear to have been detached by weathering and aqueous erosion.

From the observations of Messrs. Ashburner and Dall, it would appear that no evidences of Northern Drift have yet been detected on this coast, even as far north as British Columbia or Russian America. Neither of these gentlemen have observed any indication of a transportation of drift materials from the north towards the south, or of any condition of things similar to that which must have existed in the Eastern States during the diluvial epoch.—*Proceedings of the California Academy of Natural Sciences.* 1866. Vol 3, part iii.

MICROSCOPY.

Test Objects for the Microscope.—To such wonderful perfection has this process been carried, that M. Nobert, of Griefswald, in Prussia, has engraved lines upon glass so close together, that upwards of eighty thousand would go in the space of an English inch. Several series of these lines were engraved upon one slip of glass. By these the defining power of any object-glass could be ascertained. As test objects, they are equal to, and even rival, many natural objects which have hitherto been employed for this purpose. The delicate lines on some of the diatomaceæ are separated from each other by the 1-50,000th of an inch, while the finest lines engraved by M. Nobert are not more than the 1-100,000th of an inch apart.

The Podura scale is a most excellent "test object." According to Prof. J. W. Bailey, the diatoms *Grammatophora subtillissima* and *Hyalodiscus subtilis* are the most delicate tests. — Beale.

Diatoms. — These beautiful objects for the microscope are minute silicious plants, which from their ability to move about independently in the water, and from being supposed to have stomachs, were for a long while thought to be animals, and placed among the Infusoria.

Their hard silicious shells are characterized by being marked with fine delicate lines or rows of dots. They are found in all our waters, whether salt, brackish, or fresh. Their hard shells are preserved under bogs, where they form layers, resembling fine white silicious sand, and also in guano. They also occur fossil at Bermuda, Oran in Algeria, and Richmond, Va.

OBJECT TEACHING IN NATURAL SCIENCE.—I am strongly of opinion that it is more necessary than ever that we should teach as much as possible by the eye. In teaching any branch of natural science, the *demonstration* should be combined with *oral* teaching. The student should *see* what is described, and where it is not possible for the teacher to exhibit illustrative specimens, good models, drawings, and explanatory diagrams should be supplied. It is the duty of every teacher to study how to communicate knowledge *most easily* and *most clearly*, and to save the student as much time as possible; for it is not likely that the amount of work which is required by the various examining boards will be reduced, nor indeed is it desirable that it should be. It is, therefore, incumbent upon teachers to facilitate the communication of knowledge in every possible way. A lecturer on every branch of microscopic inquiry can now show his pupils the structures he describes. For the last three years I have carried out this plan myself, and have found that it works admirably. I am able to demonstrate from eight to twelve microscopical specimens to a large class in the course of an hour, and it need scarcely be added, such a system adds greatly to the interest of lectures, and enables the student to acquire a correct idea of structure, which it is impossible for him to obtain by reading, or from mere description with the aid of diagrams.—BEALE'S "*How to Work with the Microscope.*"

SCIENTIFIC EXPEDITIONS.

Mr. C. F. Hartt, now lecturing on Natural History in New York City, who gained much experience as an explorer in Brazil, in the late Thayer Expedition to the Amazon, under the conduct of Prof. Agassiz, purposes in a few weeks to visit anew the coast of Brazil, and study the coral reefs previously discovered by him, and also the marine fauna of these shores. Mr. Hartt goes thoroughly prepared for these important researches, by his previous experience in exploring the Geology of Nova Scotia, while connected with the Provincial Geological Survey; and also as a student and assistant for several years in the Museum of Comparative Zoölogy, at Cambridge.

Mr. J. F. Allan, of Springfield, Mass., author of a series of ornithological papers now publishing in the NATURALIST, and also one of

Prof. Agassiz' party in Brazil, starts this month to explore western Iowa, both to collect and study the animals and fossils of that little-known region. If successful in this field, he intends to push on, another season, to the Rocky Mountains, and collect in that region.

CORRESPONDENCE.

G. H. K.—The most brief and comprehensive Manuals of Taxidermy, or the art of preparing specimens of Natural History for the cabinet, are those published by the Smithsonian Institution, Washington, D. C., in pamphlet form, especially the Directions for collecting, preserving, and transporting specimens of Natural History.

J. T. G., Massachusetts.—Among the best works from which to gain a general knowledge of Natural History are Prof. Asa Gray's Botanical Series, embracing the following:—

How Plants Grow.

First Lessons in Botany.

Manual of Botany of the United States. Illustrated. 8vo. Published by Messrs. Ivison & Phinney, New York.

Agassiz & Gould's Principles of Zoölogy. Gould & Lincoln, Boston.

Mind in Nature. By H. J. Clark. Appleton & Co., New York, 1866.

Tenney's Zoölogy for Schools. C. Scribner, New York.

Harris's Insects Injurious to Vegetation. Nichols & Noyes, Boston.

Westwood's Classification of Insects. London. 2 vols. 8vo.

Dana's Manual of Geology. T. Bliss & Co., Philadelphia. 8vo.

Hugh Miller's Popular Geology, and other works, published by Gould & Lincoln, Boston.

Prof. A. Guyot's Series on Physical Geography, with his Physical Maps. C. Scribner, New York. Earth and Man. Gould & Lincoln, Boston. 12mo.

NATURAL HISTORY CALENDAR.

Ornithological Calendar for May.—The first half of May witnesses the grand culmination of the vernal migration; more species arriving between May 1st and 20th than during the rest of Spring; and probably at no period in the year are our woods so densely populated as now, when countless numbers, on their way north, spend a few days with us in their passage. Few arrive after the 15th or 20th, though in some seasons there are many representatives of species, which breed farther north, remaining till the close of the month.

1st to 7th.—The Barn Swallow, Chimney Swift, Brown Thrush, Cat Bird, Towhee Bunting, or Chewink, Least Flycatcher, Warbling Vireo, Black and White Creeper, and Whippoorwill become common. The Eaves, or Cliff, and Bank Swallows, King Bird, Golden-crowned and Water Thrushes, the Black-throated Green, Prairie, Blue Yellow-backed and Nashville Warblers; the House Wren and Marsh Wrens (*Cistothorus palustris* and C. *stellaris*), and the Summer Yellow Bird, or Yellow Warbler, begin to appear.

7th to 14th.—All the preceding become abundant, while the Bobolink, Baltimore and Orchard Orioles, Rose-breasted Grosbeak, Scarlet Tanager, Night Hawk, Maryland Yellow-throat, Veery, or Wilson's Thrush; Redstart, the Spotted Canada, Black-capped, Black-burnian, Bay-breasted, Black-throated Blue, Chestnut-sided, and Cape May Warblers; the Black-billed and Yellow-billed Cuckoos; the Red-eyed, White-eyed, and Yellow-throated Vireos; the Indigo Bird, Swainson's Thrush; the Acadian, Great-crested, Traill's, and Olive-sided Flycatchers; Henslow's Bunting, Red-headed Woodpecker, and Humming Bird arrive. The Tree and White-throated Sparrows, Hermit Thrush, and Ruby-crowned Kinglet retire northwards, or to the mountainous districts.

14th to 21st.—Wood Pewee, Yellow-breasted Chat, and Black Poll Warbler arrive. The woods and thickets, as well as the orchards and shrubbery of the garden, swarm with *Dendroicæ* or Wood Warblers, and with other species of *Sylvicolidæ* and Flycatchers.

21st to 31st.—Towards the close of the month, the various species of Warblers and their allies, that pass farther north to breed, retire thither and to the highlands. The Black Poll Warbler and Swainson's Thrush are (a few stragglers of other species still remaining) the only birds which remain in numbers, that pass north of central New England to breed.

All the summer visitors and vernal passengers have now arrived. Many of the early breeders, as the Blue Bird, Pewee, Robin, Song and Field Sparrows, etc., have, at the close of the month, nearly full-fledged young; occasionally the first brood takes wing. Others, as the Chewink, Cat Bird, Yellow-winged Sparrow, Red-winged Blackbird, Meadow Lark, Brown Thrush, Blue Jay, Chickadee, Swallows, Whippoorwill, etc., have commenced incubation; the Bobolink, Baltimore, Warbling, and other Vireos, and several Flycatchers and Warblers, have either begun building, or are pairing and selecting nest sites. In short, with one or two exceptions, all the birds have ceased roving, and choosing their summer homes, have entered upon the important duties attending the reproductive season.—J. A. A.

THE INSECTS OF MAY.—During this month there is great activity among the insects. As the flowers bloom and the leaves appear, multitudes wake from their long winter sleep, and during this month pass through the remainder of their transformations, and prepare for the summer campaign. Most insects hybernate in the chrysalis, or pupa, state, while many winter in the caterpillar or larva state, such as the larvæ of several Noctuidæ and the "yellow-bear," and other caterpillars of Arctia and its allies; while many insects hybernate in the adult or imago form, either as beetles, butterflies, or certain species of bees.

It is well known that the Queen Humble Bee winters under the moss, or in her old nest. During the present month her rovings seem to have a more definite object, and she seeks some deserted mouse-nest, or hollow in a tree or stump, and there stows away her pellets of pollen, containing two or three eggs apiece, which, late in the summer, are to form the nucleus of a well-appointed colony. The Carpenter Bees, Ceratina and Xylocopa, the latter of which is found in abundance south of New England, is busy in refitting and tunnelling out the hollows of the grape; while the Ceratina hollows out the stem of the elder, or blackberry. This little upholsterer bee carpets her honey-tight apartment, storing it with food for her young, and later in the season, in June, several of these cartridge-like cells, whose silken walls resemble the finest and most delicate parchment, may be found in the hollow stems of these plants.* The Mason Bee (*Osmia*) places her nest in a more exposed site, building her earthen cells of pellets of moistened mud, either situated under a stone, or in some more sheltered place, for instance in a deserted oak-gall, ranging half a dozen of them side by side along the vault of this strange domicile. Meanwhile their more lowly relatives, the Andrena and Halictus bees, are engaged in tunnelling the side of some sunny bank or path, running long galleries underground, sometimes for a foot or more, at the farthest end of which are to be found, in summer, little earthen urn-like cells, in which the grubs live upon the pollen stored up for them in little balls of the size of a pea. Later in the month, the Gall Flies (*Cynips*), those physiological puzzles, sting the leaves of our oaks, maples, and other trees, giving rise to the strange excrescences and multiform deformities which deface the stems and leaves of our most beautiful forest trees.

Fig 1.

The Coddling Moth. From HARRIS.

We spoke in our last number of the Coddling Moth, of which fruit-growers need to be forewarned, and here give a figure of the moth, so that it cannot be mistaken.

* We are indebted to Mr. James Angus for the facts regarding the habits of Hylocopa and Ceratina. The cells of *Osmia simillima* Smith, have been found as above described by Mr. F. G. Sanborn.

When the Kalmia, Rhodora, and wild Cherries are in bloom, many of our most beautiful butterflies appear; such are the different species of Lycæna, Thecla, and Argynnis. At this time we have found the rare larva of Melitæa Phæton, clothed in the richest red and velvety black, feeding daintily upon the Hazel Nut, and tender leaves of the Golden Rod. In June, it changes to the chrysalis state, and early in July the butterfly rises from the cold damp bogs, where we have oftenest found it, clad in its rich dress.

Later still, when the Lilac blooms, and farther south the broad-leaved Kalmia, the gaily-colored Humming Bird Moth (*Sesia*), visits the flowers in company with the Swallow-tail Butterfly (*Papilio Turnus*). At twilight, the Hawk-moth, Sphinx, darts noiselessly through our gardens, as soon as the Honeysuckles and Pinks and Lilies are in blossom.

Among the Flies (*Diptera*), Mosquitoes now appear, though they have not yet perhaps strayed far from their native swamps and fens; and their mammoth allies, the Daddy-long-legs (*Tipula*), rise from the fields and mould of our gardens in great numbers.

Of the Beetles (*Coleoptera*), those which feed on leaves now become specially active. The Squash Beetle (*Phyllobrothica vittata*, fig. 2) now attacks the Squash plants before they are fairly up; and the Plumb Weevil (*Conotrachelus nenuphar*, fig. 3. From Harris) will sting the newly-formed fruit, late in the month, or early in June. Many other Weevils now abound, stinging the seeds and fruit, and depositing their eggs just under the skin. So immense are the numbers of insects which fill the air and enliven the fields and woodlands, just as summer comes in, that a bare enumeration of them would overcrowd our pages, and tire the reader.

Fig. 3.

Fig. 2.

A word, however, about our Water Insects. Late in the month the May-fly (*Ephemera*) appears, often rising, in immense numbers, from the surface of pools and sluggish brooks. In Europe, whole clouds of these delicate forms, with their thin white wings, have been known to fall like snow upon the ground, when the peasants gather them up in heaps to enrich their gardens and farms.

The Case Worms, or Caddis Flies, begin now to leave their portable houses, formed of pieces of leaves, or sticks and fine gravel, and fly over the water, resting on the overhanging trees.

A few busy Mosquito Hawks, or Dragon Flies (*Libellula*), herald the coming of the summer brood of these indefatigable friends of the Agriculturist. During their whole life below the waters, these entomo-

logical Herods have slain and sucked the blood of myriads of infant mosquitoes and other insects; and now, in their new world above the waters, with still more intensified powers of doing mischief, happily, however, to flies mostly obnoxious to man, they riot in bloodshed and carnage.

This is the season to stock the fresh-water aquarium. Go to the nearest brook, gather a sprig or two of the Water Cress, which spreads so rapidly, a root of the Eel Grass, and plant them in a glass dish or deep jar. Pour in your water, let the sand and sediment settle, and then put in a few Tadpoles, a Newt (Salamander), Snails, (*Limnea*, *Planorbis*, and *Valvata*), Caddis Flies, and Water Beetles, together with the gatherings from a thicket of Eel Grass, or other submerged plants, being rich in the young of various flies, Ephemeras, Dragon-flies, and Water-fleas (*Entomostraca*), which last are beautiful objects for the microscope, and in a few days the occupants will "feel at home," and the aquarium will be swarming with life, affording amusement and occupation for many a dull hour, by day or at night, in watching the marvels of insect transformations, and plant-growth.—A. S. P.

PROCEEDINGS OF SCIENTIFIC SOCIETIES.

Boston Society of Natural History. *January* 16. Concluded. —Mr. W. W. Bailey read a paper on *Epigæa repens*, the May flower, by Prof. L. W. Bailey, of Fredericton, N. B., in which he mentions finding specimens exhibiting the following peculiarities: Corolla, imperfectly salverform (the petals not thoroughly coherent into a tube, which were not hairy), and apparently not *deciduous;* the stamens reverted into specimens of the ordinary kind more or less united. Some of these showing a transitional form, in having a filament-like base, but no anthers. The pistils were indistinct, and had reverted into petals.

Feb. 6, 1867.—The Secretary read a paper by Dr. S. Kneeland, on a fungoid Parasite, or Caterpillar Fungus, from the Philippine Islands, to which were appended some remarks of Mr. C. J. Sprague, on the probable botanical relations of this fungus.

Dr. J. C. White exhibited, under the microscope, living young of the Guinea, or thread-worm (Filaria Medinensis). He described the form and mode of development of the parent animal, and spoke of what was known of their habits, and their mode of effecting an entrance into the human body during bathing in places where they occurred.

Mr. W. T. Brigham stated that it was generally believed near Cal-

cutta, that a certain species of fish destroyed this worm, and only those who bathed in tanks unstocked with this fish were troubled by them.

Mr. W. Winwood Reade said, that in Africa they were much more common in Guinea proper, than on any other part of the coast; it was there generally believed to be prevalent on account of the impurity of the drinking water.

Mr. Theodore Lyman remarked on the laws of breeding Shad and Salmon, the gradual extirpation of these fish from our rivers by the erection of dams, and exhibited models of fish-ways which had recently been constructed on the Merrimac, under the direction of the State Commissioners.

Mr. F. W. Putnam, after announcing the donation of two species of fish from Lake Winnipisiogee, one the *Lota maculosa* (Ling, or fresh-water Cusk), and the other a species of Lake Trout, probably the *Salmo confinis* of De Kay, remarked that it seemed to him a matter of doubt whether many of our Lake Trout are anything more than forms of the Brook Trout. Referring also to Mr. Lyman's remarks on the habits of the Salmon, Mr. Putnam stated that Dr. Bernard Gilpin, of Nova Scotia, had recently been making observations upon the male Salmon, and had discovered that it must have three sets of teeth formed one after the other; that one set falls out just before ascending the river, when the cartilaginous enlargement of the jaws takes place; that a new set grows out during the ascent of the stream, which is destroyed during its contests with others of its sex, and by excavating hollows in the gravel for the eggs; in this condition it returns to the sea, where it again attains a new and normal set of teeth.

Section of Microscopy. Feb. 13, 1867.—Mr. Charles Stodder read a paper on the fungus found on insects, and showed four preparations which he had made for examination. Mr. Stodder also read a paper upon a recent gathering of Diatomaceous mud, from Pleasant Beach, Cohasset.

Dr. B. J. Jeffries exhibited some glasses and metallic mirrors used in examination of diseases of the eye. He made remarks upon the use of colored glasses (blue), the mode of coloring, and the advantage of this particular color (cobalt blue) over green or grey in relieving the eye from the effects of sunlight.

Essex Institute, *Salem, February* 4.—Mr. F. W. Putnam exhibited a singular specimen of the Horned Pout (*Pimelodus atrarius* De Kay) from Lake Champlain, presented by Dr. B. Pickman, of Boston. The fish was pure white, thus showing that albinos occur among fishes as well as in the birds and mammals, though this was the first instance of albinism known to him as occurring in this class.

THE LYCEUM OF NATURAL HISTORY OF NEW YORK. — At the annual meeting of the Lyceum of Natural History, held in Clinton Hall on Monday night, Feb. 25, the following officers were elected: President, Prof. Charles A. Joy (of Columbia College); First Vice-President, Prof. J. S. Newberry; Second Vice-President, Gen. Livingston Satterlee; Corresponding Secretary, Robert Dinwiddie; Recording Secretary, Robert H. Browne; Treasurer, Temple Prime; Curators, S. C. H. Bailey, Geo. N. Lawrence, Dr. Richard P. Stevens, George Suckley, M. D.; Librarian, Oran W. Morris.

This Society was founded in 1818, by Dr. Mitchell, Dr. Torrey, Mr. Cooper, and a few students of science. The early records of their meetings contain amusing accounts of the explorations made by the members to remote parts of the Island of New York, and of their adventures among the swamps and brambles of Pearl and Canal streets, Some of the more enterprising members sought for minerals in the regions of Central Park, and the analyses were published in Bruce's Mineralogical Journal. De Witt Clinton was a contributor to the Annals of the Lyceum, and Audubon, De Kay, Lucien Bonaparte, Cooper, Dana, Torrey, Le Conte, and Thomson were among the early writers who sent communications to the Society. There have only been three Presidents during the fifty years of the existence of the Lyceum, Dr. Mitchell, Dr. Torrey, and Major Delafield. The latter declined a re-election, and the honor now devolves upon a younger generation. It is proposed to celebrate the fiftieth anniversary next year, and, in view of the fact that the Society has no hall of its own, an effort will be made to raise $100,000 for the purpose of securing suitable accommodations.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The Sixteenth Annual Meeting will be held at Burlington, Vermont. The Session begins on Wednesday, August 21st, 1867, at 10 o'clock, A. M.

"The last meeting of the Association at Buffalo, N. Y., continued for a week, and was considered a pleasant and successful renewal of the yearly conventions of the Association. About ninety old members were in attendance, one hundred and twelve new members were elected, and sixty-nine papers were presented and read.

"Fears lest the cholera might prevent the Meeting at Buffalo, as it did at Cleveland for one year, caused the circular to be delayed until after many members of the Association had left their homes for the summer, or had made other arrangements inconsistent with a journey to Buffalo. On this account the meeting was not so well attended as on some other occasions. The previous meeting at Newport, R. I., had also been small. As the assessments are collected, in large part, at the meetings, the funds of the Association have suffered from two

meetings, more thinly attended than the average, following each other in immediate succession. It will be impossible to print the usual volume of Proceedings, unless the funds are largely augmented: the expense of paper and printing having greatly increased, while the collections have diminished. If the arrears now due to the Association are promptly paid, the Publications can proceed as usual, and the Association stand on an independent basis."—JOSEPH LOVERING, *Permanent Secretary, Cambridge, Mass.*

AMERICAN MICROSCOPICAL SOCIETY. *New York, January* 26, 1867. —Mr. A. M. Edwards read a paper entitled "Note on the relations of Monochromatic Light to Microscopical Observations," calling attention again to the fact of his having some time back brought before this Society a theory of his, of the relation of active illumination to vision, and the definition of objects seen through lenses; at the same time detailing some recent investigations made by others, which he considered to confirm his theory. He then proceeded to illustrate his subject by using the colored plates in Chevreul's book on the applications of colors to the industrial arts, illuminating them by the Sodium flame, gas-light, and the light of burning magnesium successively. He remarked how careful observers should be in drawing conclusions from what they think they see by means of the microscope.

Mr. J. E. Gavit detailed two cases in which he had been called upon to use the microscope for the purpose of deciding points in which large sums of money were involved. The first was to decide which of two writings crossing each other—one in black ink, the other in red—was the most recent. With a microscope, he was able to demonstrate, to the perfect satisfaction of the parties interested, which was written last. The second case was to decide if a name written to the codicil of a will was a forgery or not, and described the manner in which he had used a microscope to determine that point.

Mr. Edwards spoke of some discoveries of Prof. H. L. Smith, who thought he had seen the formation of an Amœba from the contents of a Pinnularia, and the after formation of an Actinophrys from that Amœba.

ENTOMOLOGICAL SOCIETY OF CANADA, *Quebec Branch. Annual Meeting, Jan.* 9, 1867.—After the Address of the President, the Secretary read the Third Annual Report of the Council.

A paper on a Parasite infesting the Trout, was read by Mr. William Couper, of Quebec.

This Society has also a Branch Society at London and Toronto, C. W.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA. *Feb.* 19.—The following papers were presented:—

A list of introduced Plants, mostly Southern, growing in the waste ground below Philadelphia Navy Yard, and at Kaighri's Point and Petty's Island, on the opposite shore of the Delaware, in 1864, 1865, and 1866, by Aubrey H. Smith.

On the Habits of the Cutting Ant of Texas, by G. Lincecum, M. D.

A letter was read from C. M. Wetherill, Bethlehem, Pa., regarding the Structure of Hacolumites.

A communication was received from the Recorder of the Conchological Section, announcing their organization and the election of officers.

March 5.—Prof. Leeds remarked on the Magnesium Light. Prof. Hayden exhibited some field sketches of the far West. Prof. Ennis spoke on the origin of the Stars, the causes of their motions, and their light.

ENTOMOLOGICAL SOCIETY OF PHILADELPHIA.—At a meeting held March 11, 1867, the following By-Law was unanimously adopted:—

"Article I, Chapter I.—The Society shall be called the AMERICAN ENTOMOLOGICAL SOCIETY, and is instituted for the improvement and advancement of Entomological Science, and the investigation of the character and habits of Insects."

The above change has been made for two reasons. 1st. That the Society has to rely on the country at large for support, and in order to receive this support, the erroneous idea which is in many minds, namely, that the Society is a *local* institution, must be displaced. 2d. It is believed that this change in the name will extend the reputation and claims of the Society, and awaken new and more extended exertions for the permanent support of the only Entomological Society in the United States.

THE YORK INSTITUTE OF SACO, MAINE.—This Society, recently organized for the promotion of the Natural Sciences and History, are adding new members to their ranks, and from the proceeds of a course of lectures, have furnished their room with cases in which to display their collection.

PORTLAND SOCIETY OF NATURAL HISTORY.—We are glad to learn that this Society, despite their unprecedented misfortunes in losing for the second time their entire collections by fire, are about to resume their publications by completing the first volume of their "Proceedings." The first part was published several years since. The second part, now to be published, will contain seventy-two pages.